International Journal of Surgery Case Reports 2 (2011) 65–67

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Descending necrotizing mediastinitis as a complication of odontogenic infection

S. Diamantis, H. Giannakopoulos*, J. Chou, J. Foote

University of Pennsylvania, Department of Oral and Maxillofacial Surgery, Philadelphia, PA 19104, USA

ARTICLE INFO

Article history:
Received 10 January 2011
Accepted 12 January 2011
Available online 1 February 2011

Keywords:
Descending necrotizing mediastinitis
Odontogenic infection
Oropharyngeal infection

ABSTRACT

Descending necrotizing mediastinitis (DNM) is a serious, life threatening complication that can occur from a common odontogenic infection. Even with advancements in antibiotics, diagnostic imaging, and surgical management, the mortality rate remains between 20 and 40%. It is imperative that the practitioner taking care of patients with odontogenic infections be sensitized to this potentially fatal complication. We report the successful management of a case of mediastinitis complicating an odontogenic infection in a 39-year-old male.

1. Introduction

Acute mediastinitis is a serious infection of the mediastinal connective tissues and the structures which they surround. One of the most lethal forms of mediastinitis is descending necrotizing mediastinitis (DNM), which usually occurs as a complication of odontogenic infections or peritonsillar abscesses.[1,2] Most oropharyngeal infections are self-limiting and contained. However, they can spread through the fascial and deep neck spaces while progressing inferiorly into the mediastinum, especially in the diabetic, immunocompromised, or debilitated patient.[3–5] DNM is characterized by polymicrobial aerobic and anaerobic organisms indigenous to the oral cavity. The mortality rate of descending necrotizing mediastinitis was originally as high as 50%.[6] With advancements in antibiotics, diagnostic imaging, and surgical management, the mortality rate has declined marginally to 20–40%.[2,4,7–10]

2. Case report

The patient is a 39-year-old gentleman with no significant past medical history, who presented to the University of Pennsylvania, School of Dental Medicine, with a chief complaint of a 1 week history of constant, throbbing pain associated with his right mandibular third molar tooth. Despite being on amoxicillin, prescribed by a local general dentist, for 5 days, he reported worsening right facial swelling and mild odynophagia, but denied dysphagia, dyspnea, nausea, vomiting, fevers, or chills. On physical examination, he was afebrile and hemodynamically stable. He appeared in no acute distress, but had moderate to severe right submandibular non-fluctuant swelling that was firm, erythematous, and warm to palpation. There was also some crossover to the other side and submental space involvement. He had no trismus or sublingual edema. His oropharynx revealed mild right peritonsillar edema and erythema, with normal appearing tonsils. His uvula was midline, but edematous. He had malposed teeth 1, 16, 17, and 32 with mild erythema of bilateral mandibular third molar operculum, and fair oral hygiene. Panorex radiograph revealed an irregular pericoronal radiolucency associated with partial bony impacted tooth 32 and caries associated with tooth 31 (Fig. 1). Thus, it was recommended that he report to the Emergency Department and be admitted to the hospital for further evaluation by CT scan, intravenous antibiotics, pain control, intravenous fluids, and possible surgical intervention.

However, on the following day, the patient returned to the dental school, now with worsening symptoms. He was afebrile, with a WBC of 7.6, but was in moderate distress, was diaphoretic, had difficulty handling secretions, and had bilateral submandibular and submental cellulitis extending cervically to the anterior chest wall. Hence, he was emergently transferred to Penn Presbyterian Medical Center to secure his airway and for management of clinically evident descending necrotizing mediastinitis.

Upon arrival, the patient had a CT scan and anesthesiology was notified of an anticipated difficult airway intubation and subsequent surgical intervention. The CT scan revealed diffuse neck edema, and air in the parotid, parapharyngeal, submandibular, and submental spaces, and also, around the bilateral sternocleidomastoids, anterior to the thyroid gland, and extending into the anterior superior mediastinum (Fig. 2). The uvula and epiglottis were also found be edematous, thus causing airway constriction. He was then taken to the operating room and an incision and drainage of bilateral submandibular, sublingual, and submental spaces were

* Corresponding author at: Department of Oral & Maxillofacial Surgery, Hospital of the University of Pennsylvania, 3400 Spruce St., 5 White Bldg., Philadelphia, PA 19104, USA. Tel.: +1 215 901 2614; fax: +1 215 349 8595.
E-mail address: helen.giannakopoulos@uphs.upenn.edu (H. Giannakopoulos).

2210-2612
doi:10.1016/j.ijscr.2011.01.004

Fig. 1. Panorex at initial presentation. Note irregular pericoronal radiolucency associated with partial bony impacted tooth 32, caries tooth 31, and retained tooth root 12 with associated periapical radiolucency.

performed, intraoperative cultures were sent, and the patient was started on IV vancomycin and Unasyn per Infectious Disease recommendations. Thoracic Surgery was consulted as well, who was concerned about aerodigestive tract injury, considering the amount of air in the mediastinum.

On day 5, the patient's clinical exam worsened. He now had a temperature of 101.6, increased firmness, erythema, and warmth of the submandibular, submental, and anterior neck region, increased trismus, and a WBC of 19.6. Repeat CT scan showed extensive abscess formation of the bilateral neck, a large collection anterior to the thyroid gland, increasing pretracheal soft tissue swelling extending into the superior mediastinum, large bilateral pleural effusions, and a small pericardial effusion. The patient was taken to the operating room where his collections in the head and neck were drained and packed by Oral and Maxillofacial Surgery. In addition to ruling out injury to aerodigestive structures and placing bilateral chest tubes for the large pleural effusions, Thoracic Surgery drained and pulse irrigated the anterior superior mediastinum transcervically (Fig. 3).

By hospital day 6, the wound cultures were growing *Streptococcus constellatus* and *Propionibacterium acnes*, so clindamycin was added. The patient's immunology profile was found to be normal within this time period as well. Repeat CT scan showed new phlegmon versus abscess under the aortic arch and new paratracheal and right base of tongue abscesses. He was taken back to the operating room and the paratracheal collection was drained by Oral and Maxillofacial Surgery. Thoracic Surgery drained the pericardial and aortic arch abscesses via video-assisted thoracoscopy and a right thoracotomy. The following day, he developed new bilateral superficial temporal space abscesses that were drained. In addition, extraction of teeth 1, 12, 16, 17, 31, and 32 were performed. Upon extraction of the right mandibular third molar, scant purulent discharge was expressed.

Over the next 2 weeks, he went to the operating room two additional times for thoractomy washouts for change in clinical status. Fungal cultures from the initial incision and drainage began to grow candida albicans, and he was becoming progressively more hypothermic, which was concerning for fungemia and was hence placed on fluconazole. After developing pseudomonas pneumonia, his antibiotics were changed to meropenem, Amikacin, and vancomycin for even broader coverage.

Then, over the next 10 days, his clinical exam steadily improved, and CT scans showed no new collections. He was subsequently extubated on hospital day 27, and the drains were irrigated and backed out slowly over another 5 days. He was left with pharyngeal dysphagia, decreased laryngeal elevation, and odynophagia. Due to his extensive hospital course, he was also deconditioned and required physical rehabilitation.

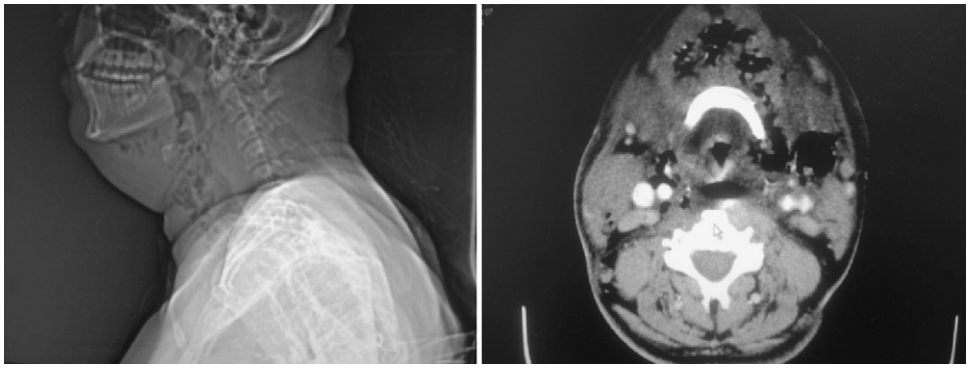

Fig. 2. Preop CT. (A) CT topogram showing extensive air in anterior neck and submandibular region. (B) Axial view below level of mandible showing air in the anterior and bilateral neck region.

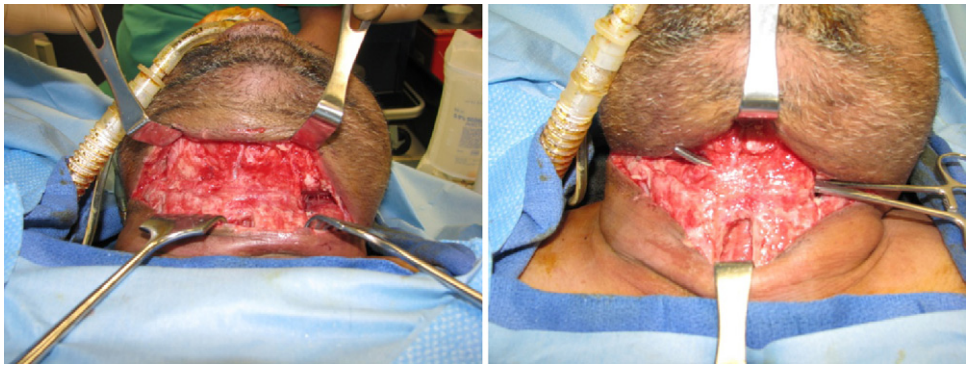

Fig. 3. (A) Exposure needed to drain collections in both the suprahyoid and infrahyoid spaces. (B) Clamp anterior to trachea and posterior to thyroid gland after collection in space drained. Also note inferior retractor exposing access to superior mediastinum.

3. Discussion

DNM is a rare, life-threatening complication from common odontogenic and oropharyngeal infections. Less often, DNM can occur from epiglottitis, suppurative parotitis, or skin infections.[2,11,12] Furthermore, cervical trauma complicated by infection can also lead to DNM.[7,13] Estrera et al.[14] defined the criteria for diagnosis of DNM as: (a) clinical evidence of severe oropharyngeal infection, (b) characteristic radiological features of mediastinitis, (c) documentation of necrotizing mediastinal infection at operation or post-mortem, and (d) establishment of the relationship between DNM and the oropharyngeal process.

Knowledge of the anatomy is critical in the diagnosis and management of DNM. It is also helpful to understand the potential serious complications that can occur from common oropharyngeal infections. Odontogenic infections, which are primarily seen by dentists, are responsible for the majority of the two most serious neck infections: Ludwig's angina and DNM. Benign cysts and tumors also have the potential to become infected and result in serious complications.[15] Furthermore, suppurative parotitis needs to be followed closely, since it can spread inferiorly and become life-threatening.[12] There are three primary layers of the deep cervical fascia that partition into three spaces which oropharyngeal infections spread along to reach the mediastinum. These spaces are the pretracheal, the retrovisceral, and the prevertebral space.[16] The pretracheal fascia fuses with the pericardial and parietal pleura in the anterior mediastinum. In our case, we believe the infection spread from pericorinitis involving the right mandibular third molar, extended to the submandibular space, spread anterior to the thyroid cartilage and gland, and then reached the anterior mediastinum via the pretracheal space. The infection also spread to the submental, sublingual, lateral pharyngeal, masseteric, parotid, and superficial temporal spaces.

DNM is an infrequent, but lethal disease. This is in part due to delay in diagnosis and aggressive surgical treatment. Initial diagnosis can be made by history and physical examination, but is often difficult. Plain radiographs of the neck and chest can demonstrate subcutaneous emphysema, a widened mediastinum, and pleural effusion.[3,8,14] However, these signs often reveal themselves late in the disease process. CT scanning immediately confirms mediastinitis with high accuracy. Any patient who has an oropharyngeal or odontogenic infection with neck swelling and/or pain concerning for DNM should have a contrast-enhanced CT of the neck and chest to evaluate the spread of infection.[3,17] It is also imperative that the practitioner continue to employ CT scanning to monitor progress of treatment.[3,7–9,17–19]

Management of DNM includes IV anibiotics, airway management, and surgical drainage of the cervical and mediastinal collections. Some controversy exists regarding transcervical drainage versus transthoracic drainage.[8,9,14,19,20] Many argue that transcervical approach is adequate with infections that are primarily in the anterior superior mediastinum above the carina and that transthoracic approach should be reserved for infections that spread more inferiorly.[9,14,20] Additionally, it is essential that the source of infection be addressed.

4. Conclusion

DNM is a serious, life-threatening complication that can occur from a common odontogenic infection. The practitioner taking care of patients with odontogenic and oropharyngeal infections should be sensitized to this potentially fatal complication.

Conflict of interest statement

There are no conflicts of interest for this case report.

Funding

There were no sources of funding sponsoring this study.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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